

WHAT IS CLAIMED IS:

- 5u5
A2
1. A liquid crystal display method for displaying an image to pixels by supplying a data signal to a plurality of column lines arrayed in parallel to one another and by supplying a select signal to a plurality of row lines arrayed in parallel to one another in a direction in which the row lines intersect the column lines, the pixels to which the image is displayed being made up of liquid crystals located at intersecting points, or vicinities of the intersecting points, between the column lines to which the data signal is supplied and the row lines to which the select signal is supplied, the liquid crystal display method comprising:
- 15 a step for supplying the select signal to the nth (where n is a positive integer) row line and also supplying the data signal to the column lines, thereby displaying an image based on the data signal to pixels located at intersecting points between the nth row line and the individual column lines;
- 20 a step for next supplying the select signal to the (n+m)th row line, where "m" is a positive integer, and also supplying to the column lines a black display signal for displaying a black image to pixels, thereby displaying the black image to pixels located at intersecting points

between the $(n+m)$ th row line and the individual column lines;

5 a step for iterating the image display operation based on the data signal and the black image display operation while sequentially shifting the row line to which the select signal is supplied; and

10 a step for, with a return to the first row line if the $(n+m)$ th row line, to which the select signal is supplied, is beyond the last row line, displaying the image based on the data signal and the black image to all the pixels within one frame period.

2. A liquid crystal display method for displaying an image to pixels by supplying a data signal to a plurality of column lines arrayed in parallel to one another and by
15 supplying a select signal to a plurality of row lines arrayed in parallel to one another in a direction in which the row lines intersect the column lines, the pixels to which the image is displayed being made up of liquid crystals located at intersecting points, or vicinities of
20 the intersecting points, between the column lines to which the data signal is supplied and the row lines to which the select signal is supplied, the liquid crystal display method comprising:

25 a step for supplying the select signal to the n th row line (where n is a positive integer) and also supplying

the data signal to the column lines, thereby displaying an image based on the data signal to pixels located at intersecting points between the nth row line and the individual column lines;

5 a step for next supplying the select signal simultaneously to a plurality of row lines other than the nth row line, and also supplying to the column lines a black display signal for displaying a black image to pixels, thereby displaying the black image to pixels
10 located at intersecting points between the plurality of row lines and the individual column lines;

a step for iterating the image display operation based on the data signal and the black image display operation while sequentially shifting the row line to which
15 the select signal is supplied; and

a step for, with a return to the first row line if the plurality of row lines, to which the select signal is simultaneously supplied, are beyond the last row line, displaying the image based on the data signal and the black
20 image to all the pixels within one frame period.

3. The liquid crystal display method according to Claim 2, wherein
the plurality of row lines are $(n + \alpha \cdot m)$ th ($\alpha = 1, 2, \dots, p$ (where p is a positive integer)) lines.

4. The liquid crystal display method according to Claim 2, wherein

the plurality of row lines are $(n+\alpha \cdot m)$ th to $(n+\alpha \cdot m+k-1)$ th ($\alpha = 1, 2, \dots, p$ (where p and k are positive integers)) lines.

5. The liquid crystal display method according to Claim 1, wherein

supply time of the data signal and supply time of the black display signal are equal to each other.

6. The liquid crystal display method according to Claim 1, wherein

supply time of the data signal is longer than supply time of the black display signal.

7. The liquid crystal display method according to Claim 1, wherein

value of the m is set so as to satisfy the following relationship:

$$f \times m / N > t$$

where N is the number of row lines,

f is the one frame period, and

t is response time of liquid crystals at a switch from white display to black display.

8. The liquid crystal display method according to Claim 4, wherein

e of the k i
 tionship:
 $\geq T_0$
 s one-time supp
 is the shortes
 llows white dis
 display.
 liquid crystal
 in
 ltage V_d for a
 for black dis
 signal are set
 positive polari
 nter electrode,
 V_r in normally
 V_r in normally
 negative polar
 electrode,
 V_r in the norm
 V_r in the norm
 quid crystal di
 h are formed a
 in parallel t

e of the k i
 tionship:
 $\geq T_0$
 s one-time supp
 is the shortes
 llows white dis
 display.
 liquid crystal
 in
 ltage V_d for a
 for black dis
 signal are set
 positive polari
 nter electrode,
 V_r in normally
 V_r in normally
 negative polar
 electrode,
 V_r in the norm
 V_r in the norm
 quid crystal di
 h are formed a
 in parallel t

5

T_0 is the shortest time of the black display signal that allows white display to be completely changed over to black display.

10

a voltage V_d for a case where the data signal is a data signal for black display and a voltage V_r of the black display signal are set so as to satisfy the following relationship:

15

$V_d < V_r$ in normally white mode, and

$V_d > V_r$ in normally black mode; and

20

$V_d > V_r$ in the normally white mode, and

$V_d < V_r$ in the normal black mode.

25 A3

10. A liquid crystal display device having: a display panel in which are formed at least a plurality of column lines arrayed in parallel to one another, a plurality of

row lines arrayed in parallel to one another in a direction in which the row lines intersect the column lines, and pixels made up of liquid crystals located at intersecting points, or vicinities of the intersecting points, between the column lines and the row lines; a column line driver for supplying a data signal to the column lines; and a row line driver for supplying a select signal to the row lines, the liquid crystal display device comprising:

a display control section for supplying an image signal and a control signal to the column line driver, while supplying a control signal to the row line driver, thereby controlling image display operation to the display panel;

black display signal generating means for generating a black display signal to thereby display a black image to the pixels; and

a selector switch provided in the column line driver and operative for switchedly selecting alternately between a data signal based on an image signal derived from the display control section and a black display signal derived from the black display signal generating means, wherein

the display control section supplies to the row line driver the control signal for making the row lines sequentially selected, where the select signal is supplied

to the nth row line while the data signal is selected by the selector switch, and where the select signal is supplied to the (n+m) row line while the black display signal is selected by the selector switch.

5 11. A liquid crystal display device having: a display panel in which are formed at least a plurality of column lines arrayed in parallel to one another, a plurality of row lines arrayed in parallel to one another in a direction in which the row lines intersect the column lines, and
10 pixels made up of liquid crystals located at intersecting points, or vicinities of the intersecting points, between the column lines and the row lines; a column line driver for supplying a data signal to the column lines; and a row line driver for supplying a select signal to the row lines,
15 the liquid crystal display device comprising:

a display control section for supplying an image signal and a control signal to the column line driver, while supplying a control signal to the row line driver, thereby controlling image display operation to the display
20 panel;

black display signal generating means for generating a black display signal to thereby display a black image to the pixels; and

a selector switch provided in the column line
25 driver and operative for switchedly selecting alternately

between a data signal based on an image signal derived from the display control section and a black display signal derived from the black display signal generating means, wherein

5 the display control section supplies to the row line driver the control signal for making the row lines sequentially selected, where the select signal is supplied to the nth row line while the data signal is selected by the selector switch, and where the select signal is
10 supplied to a plurality of row lines other than the nth row line while the black display signal is selected by the selector switch.

12. The liquid crystal display device according to Claim 10, wherein
15 the row lines are divided into L (where L is a positive integer) blocks on an m-line basis;

 the row line driver comprises L partial row line drivers for supplying a select signal to row lines of each block.

20 13. The liquid crystal display device according to Claim 10, wherein

 the control signal from the display control section to the column line driver includes a switching control signal for controlling switching operation
25 performed by the selector switch; and

the switching control signal makes select time of the data signal longer than select time of the black display signal.

14. The liquid crystal display device according to
5 Claim 10, wherein

the control signal from the display control section to the column line driver includes a switching control signal for controlling switching operation performed by the selector switch; and

10 the switching control signal makes select time of the data signal and select time of the black display signal equal to each other.

15. The liquid crystal display device according to
Claim 11, wherein

15 the control signal from the display control section to the row line driver includes a discriminant signal for discriminating whether it is a black display signal supply period during which the black display signal is supplied; and

20 based on the discriminant signal, the row line driver supplies the select signal to the $(n+m)$ th to $(n+m+k-1)$ th row lines during the black display signal supply period.

16. The liquid crystal display device according to
25 Claim 15, wherein

the control signal from the display control section to the row line driver includes a scan start signal, and wherein

the row line driver comprise:

5 a shift register having a plurality of latch circuits; and

scan start signal supplying means for supplying the scan start signal to the first latch circuit of the shift register during a data signal supply period, and also
10 supplying the scan start signal to continuous k latch circuits starting from the mth latch circuit of the shift register during a black display signal supply period.

17. The liquid crystal display device according to Claim 16, wherein

15 the scan start signal supplying means is enabled to change the latch circuit number "m" and the number of latch circuits "k" for the black display signal supply period.

18. The liquid crystal display device according to
20 Claim 17, further comprising:

supply control means for controlling operation of the scan start signal supplying means, and

the supply control means outputs a control signal for setting the latch circuit number "m" to the scan start

signal supplying means based on a scan-start-position designating signal from external.

Sw
Au
5 19. The liquid crystal display device according to Claim 10, wherein
the display control section, in response to a command signal from external, selectively outputs a control signal for a first display mode in which a black display signal supply operation based on an operation performed by the selector switch is performed, or a control signal for a
10 second display mode in which a black display signal supply operation is not performed with the selector switch out of operation.

20. The liquid crystal display device according to Claim 19, further comprising:
15 a signal-use reference power supply for setting a voltage of a data signal supplied from the column line driver, wherein

the voltage of the signal-use reference power supply is changeable between the first display mode and the
20 second display mode.

21. The liquid crystal display device according to Claim 19, further comprising:

motion picture/still picture discriminating means for monitoring data of the same position on a screen based
25 on an image signal derived from the display control

section, thereby discriminating whether a picture based on the image signal is a motion picture or a still picture, and outputting the command signal representing a result of the discrimination to the display control section.

5 22. The liquid crystal display device according to
SWS
AS Claim 19, further comprising:

a backlight for illuminating the display panel from its rear side; and

backlight adjusting means for switching
10 brightness of the backlight between the first display mode and the second display mode according to the command signal.

23. The liquid crystal display device according to Claim 19, wherein

15 the black display signal generating means is a black display signal use power supply, and

voltage of the black display signal power supply is changeable between the first display mode and the second display mode.

ADD

C